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ABSTRACT

WHILE REVIEWING THE CONTROVERSIAL CONCEPT OF DESCRIBING LANGUAGE VIA THE PHONEME, THE AUTHOR SPELLS OUT MANY PROBLEMS CAUSED BY THE DISCREPANCIES OF PHONEMIC THEORY AND ACTUAL SPEECH PRODUCTION. PHONOLOGICAL VARIATION IN ACTUAL SPEECH UTTERANCES PROMPTS THE ANALYSIS OF THE PHONOLOGY OF LANGUAGE ON TWO LEVELS--THE PHONEMIC AND THE DISTINCTIVE FEATURE. FINAL CONSIDERATION OF THE NATURE AND IMPORTANCE OF REDUNDANCY IN HUMAN COMMUNICATION SHEDS ADDITIONAL LIGHT ON THE IMPLICATIONS OF PHONEMIC VARIATION. (RL)

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VARIATIONS IN PHONOLOGICAL STRUCTURES[1]

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In recent years a controversy concerning the value, or lack thereof, of the concept of the phoneme for describing languages runs through the linguistic literature. The phoneme has been defined as "... small families of sounds, each family consisting of an important sound of the language ..."[2] and simultaneous bundles of distinctive features.[3] Trubetskoi says, "Le phoneme ne peut être défini ... mais seulement et uniquement par sa fonction dans la langue."[4] By "fonction" Trubetskoi means a hypothetical construct which represents a contrast which transmits meaning. In contrast with these, and many many other, defnitions of the phoneme, Chomsky states that, "... taxonomic phonemics is not incorporable into a descriptively adequate grammar."[5] It is not the purpose of this paper to get overly involved in this controversy, but the data presented below may influence the thinking of those who approach the problem as a scientific question.

The generally accepted dichotomy between speech and language, which was formalized by Saussure, implies that there is a language structure which is a set of abstractions and a set of rules for combining these abstractions into utterances. Further, any actual speech act is an imperfect representation of a theoretical sequence of these abstract units, be they phonemes, morphemes, etc. The question must then arise as to how close an approximation is necessary for a given unit, take the phoneme as an example, to convey the correct information. This point has been belabored from many points of view in the literature, but relatively little data has been presented to indicate the types of variations that occur in real languages under normal speech conditions. There are problems involved in any attempt to study this, because we know from looking at spectrograms that the actual phonetic variations for a given English vowel, even when produced by the same speaker in the same word in repeated utterances, provide a bewildering array of variants.[6] The theory of distinctive features is an attempt to clarify this picture somewhat, but it is not at all clear at this point that all of the distinctive features occur with any degree of regularity, and the distinctive features, i.e. gravity, acuteness, etc. are themselves range units involving considerable variation rather than specific features which are invariable. Further, in trying to study this type of variation, the linguist is plagued by the fact that he does not perceive the phonetic facts but rather a form of modified phonemics. It is quite probable that if human beings were capable of hearing the phonetics involved in a lnaguage, communication would not be possible. The perceptions, even of the trained fieldworker, are modified by the Markov Process, i.e. we hear sounds that are left out in a given utterance because we know that they should be there.

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This investigation is an attempt to look objectively at the range of phonetic variations found in the same morpheme in repeated utterances by the same speaker in Hanis Coos in order to better understand this problem and some of its implications for linguistics.

In an attempt to reduce the number of variables, other than the admissible free variations in the linguistic structure, to a minimum, a sample of phonetically recorded mythologic text materials for Hanis Coos was selected.[7] These myths represent the speech of a single speaker, recorded by the same man, Melville Jacobs. The linguistic fieldworker continually attempts to record as accurately as possible a set of symbols which displays visually for the reader the articulatory movements which were made in order to produce the elicited utterances. Yet a quick examination of almost any collected body of published text shows a variety of transcriptions for a given morpheme. These differences in transcription can be the result of three things: 1) errors on the part of the linguist, 2) errors on the part of the speaker and 3) admissible variations in the language structure. Items 1 and 2 above should be minimal in a collection of folkloristic texts, because the linguist usually has the speakers repeat the material several times as he records it, and the informant usually speaks much more distinctly in an eliciting session than he does in normal conversation. Therefore the variation which is found in such a rigidly controlled situation should be much less than that which would be found in normal conversations. This would then represent a minimal amount of variation and should tell us something about the nature of variation generally in linguistic structures.

Once the material for the study had been selected, the procedure was to read through the text and transfer each morpheme to a 3 by 5 card. As recurrences of a given morpheme were found they were checked against the original card. If the two occurrences were the same, the second was not recorded, but if there was any recorded phonetic difference, both transcriptions were entered on the same card. This procedure yielded a file which contained every phonetic variant recorded for every Hanis morpheme found in the text between pages 133 and 229. In order to reduce the volume of examples to a workable number, we will discuss only the major morphemes, i.e. roughly equivalent with stem forms. In Hanis there are some stem forms which are minor morphemes, i.e. grammatical elements, but there are no major morphemes, i.e. lexical units, which are not stems.

In the major morpheme file there were 231 cards, each containing the variants of a single morpheme. Of this 231, 156 were in all occurrences transcribed with the same set of symbols. This means that 65 or just over 28% of the morphemes were transcribed differently in successive utterances. When one considers the fact that a large number of the morphemes which were recorded only one way occurred only once in the text and hence could not be transcribed differently, the amount of recorded variation is very great indeed. It is equally obvious that there is a great deal of variation which is not recorded in those morphemes which occur repeatedly but are transcribed with the same symbols.

Comparing Jacobs' transcription with that of Leo J. Frachtenberg for a moment, we find that the latter author utilized fourteen vowel symbols,[8]

excluding glides which are symbolized by sequences of two segments, in contrast with six utilized by Jacobs.[9] This reduction was achieved by combining the three high front and three high back vowels into one high front and one high back respectively, comgining e with ä into ɛ, dropping the long and short o and interpreting ē as a glide. Thus it is clear that Frachtenberg was recording a great deal of variation that Jacobs was not. One of the strongest reasons for combining many of Frachtenberg's symbols into tentative phonemes was the fact that Frachtenberg recorded the same morpheme alternately with different symbols. Hence it seems clear that there was phonetic variation in the utterances which Jacobs felt were structurally irrelevant. Much of the variation in Frachtenberg's transcription is generally considered to be sloppy recording, but it is perhaps more likely that his recordings were overly precise phonetically and as a result obscured the phonologic structure. The more aware one is of the structure of the phonological system the more consistent the transcription becomes, because the linguist becomes aware of what phoneme should be in a particular slot in a given morpheme and hears it there whether it actually occurs or not.

One of the simplest types of variation which occurred was a stress shift. This may be the result of a legitimate phoneme or morpheme of stress, which moves about, and hence is not as interesting as some of the other types, but here are four examples just to illustrate the alternation.

di·´ɮ ~ di·ɮ	thing	ha´gadi ~ haga´di	trail
hi·´mɛ ~ hi·mɛ	children	itsɛ·´m ~ itsɛ·m	prepare

The examples above illustrate a recorded stress difference with all other features remaining the same. There are also examples of a change in one recorded segment with all else remaining constant.

ba'a·´hit ~ ba'a´hit	filled
ɡɛ ~ ɡɛ^{i}	act
ɡɛɮi´m· ~ ɡɛɮo´m·	birth
hu·´wɛ ~ hu´wɛ	leave
kwi·´nɛ·´wɛt'ɮ ~ kwi·´n̄ɛ·´wɛt'ɮ	poor
kwna´i ~ kwna·´i	see

Contrary to what might be expected, the two simple types of variation illustrated above account for a relatively small percentage of the total number of morphemes which were found recorded differently in different places. Below is a list of morphemes some of which occur with a variety of quite different transcriptions.

aq'ham ~ aq'aM ~ aq'mi· ~ aq'mi·´	go
bibi ~ bi´bi ~ pi'i	return

di·´luɬ ~ di·´'lu´tɬ ~ di·´luᶜɬ	boy
dji· ~ ditc	come
dji·tci ~ dji·tc ~ dji'itc	understand
dlu' ~ dlu´ ~ dlu·ʿ	stay
du·´waᶜt ~ du´´'wuts ~ du´wa ~ duwa´	catch
dza´mt' ~ dzɛ´'mɛt'	loosen
ɡ̣ɛdə´mis ~ ɡ̣ɛdə´mhis ~ ɡ̣ɛdi´mis	five
ɡ̣ɛk'ʷ'l ~ ɡ̣ɛk'ɛl	sing
ɡ̣ɛ.u´nɛ·ʟt ~ ɡ̣ɛ´unɛt ~ ɡ̣ɛwu´nt. ~ ɡ̣ɛ´unt	angered
hauts ~ ha´ᵘts	built
hɛlɛq ~ hala·g ~ hɛ·´l·ɛq ~ hɛ´l·ɛq ~ hɛl·ɛq	arrive
hu´'mis ~ hu'mis ~ hu·´'məs ~ hu´ms	wife
ilwɛ´ʿdjis ~ ilwɛ´ʿdjəs ~ i´lwɛ´ʿdjəs	heart
kʷɬi´'yiχ ~ kʷɬi'yi´χ ~ kʷɬiyɛχ ~ kʷɬi'yiχ	stone
k'a´Lt ~ k'al·	call
k'ʷə´nyau ~ k'wənyau ~ k'wən·yau ~ k'wə´ nyau	food
lɛɡ̣ɛ´w·ɛ ~ lɛɡ̣ɛ´uwɛ	die
lt ~ ld ~ tɬ	speak
ɬa· ~ ɬa ~ ɬ'a	go
ma´ihᵘ ~ ma´ihᵂ	vulva
ma´nχ̣tit ~ ma´nktit ~ manχ̣tit	beat
mɛɡ̣ɛ´'ɛn ~ mɛɡ̣ɛ·n	song
mɛ· ~ mɛ ~ mɛ·´	people
na·´nd ~ nant ~ na·´nt ~ nəhand	quantities
si´kinɛn ~ siχ̣i´nχ̣ɛm	headman
tcwɛ·l ~ tcwɛ´ʿl ~ tcwɛ´ɬ ~ tcwɛ´ɬ	fire

a´tsə ~ a´tsa ~ a´ts ~ tsə	feed
wutxɨɛ ~ wu´txɨɛ ~ wu´txɨa ~ wətxɛ´ ~ wutxɛ´ ~ wutxa´	return
yaq'a´im ~ yaq'ma ~ yɛq'aim	lack
yi´xɛ ~ yɛxɛ ~ yixɛ´ ~ yixɛi ~ yi´xɛ^{i}	one

The forty-three morphemes listed here contain about two-thirds of the morphemes found with different transcriptions at different places in the text. While it is not a complete list, all of the different types of variations found are represented by the examples. The significance of the different transcriptions is at least partially determined by the interpretation one puts on it. If one assumes that these are transcription errors or informant errors, then the importance is lost. However, it hardly seems credible that over one fourth of the total inventory of major morphemes would be erroneously represented at one place or another in such a short text; certainly not in the highly structured situation provided by a collection of myths by an able and experienced fieldworker. Keep in mind that this is not variation from one speaker to another or one linguist to another, because this is one speaker recorded by one fieldworker. If on the other hand one interprets this as acceptable variation in the phonetic quality of the phonemes involved, these alterations have significance for linguistic theory.

In discussing the significance of this data for linguistics, one must say something about the theory of language analysis, because the significance is somewhat different for different theories. If one accepts the phoneme as an essential and basic unit in the description of a language structure, the idea of phonemic overlap must be accepted as a fact, a phenomenon which is also seen in spectrographic evidence, but less clearly. Statements, which occur in the literature, to the effect that different phonemes do not have identical phonetic forms in identical environments are untenable when one observes differences as great as: k^{w}ɬi´' yix ~ k^{w}ɬiyɛx, stone, a´tsa ~ a´tsə, feed, gɛɬi´m· ~ gɛɬə´m·, birth, du·´wa't ~ du·´'wuts, catch, and wutxɛ´ ~ wətxɛ´, return, in the same morpheme. The next to last example, i.e. du·´wa't ~ du·´wuts, illustrates the range of variation possible in a given environment.

If one were to look at the transcription of Frechtenberg, he would find more different transcriptions for a given morpheme, but it seems unlikely that the range of variation would be much greater. The quality of the /u/ phoneme ranges from mid-central to low back to high-back. The /i/ phoneme ranges over mid-central, mid-front-open to high-front-close. Either /a/ and /ɛ/ range freely over the same area, i.e. mid-front-open to low-central to mid-central, or they constitute a single phoneme. Both Frachtenberg and Jacobs postulate vowel harmony to account for the variation between /a/ and /ɛ/ in Hanis, but if this is so, it is certainly a different type of phenomenon from vowel harmony in Turkish, because in Turkish there

are great numbers of clear-cut minimal pairs showing the distinctive nature of the phonemes, but this is not so for Hanis, and in Turkish the variations are rigidly structured by the phonological sequences in which the morphemes occur. This also is not the case with Hanis, as /ɛ/ and /a/ replace each other in identical morphological and phonological sequences. However, by an interpretation, the mid-central area is shared by all phonemes and the mid-front-open area is shared by at least two and possibly a third, i.e. /ɛ/, /i/ and possibly /a/. The existence of free ranging variation such as this has been amply demonstrated by the spectrograph for several years, but most linguists appear to be ignoring it.

Changes in the phonemic shape of morphemes has led some scholars to dismiss the concept of the phoneme as merely a convenient shorthand. However, this only brings the problem down one level of analysis to the level of the distinctive feature. Suppose one abandons the phoneme and works only with the distinctive feature, does this cover the observable variation in the composition of morphemes? Clearly not, because "gravity" is not a rigidly observable feature, any more than is the phoneme, but is a range of phonetic quality. Hence in a given stream of speech certain distinctive features will be omitted or the distinction between two features will be neutralized just as on the phonemic level, and one faces the same set of problems, e.g. how many distinctive features are present in a sentence such as /skʷəp/ in English for <u>let's go up</u>?

One solution to the problem of variation in the phonetic shape of morphemes in repeated utterances of the same sentence is to consider utterances as if they were sequences of abstractions and study them in their full form only. However, this same solution is equally valid on the phonemic level. In terms of discovery procedures the linguist is forced to compare the shortest elicitable utterances because this reduces the number of uncontrolled variables to a workable number just as a physicist does in his laboratory. Minimal pairs, i.e. single morphemes which have a short segment which native speakers recognize as different and other segments which the native speakers recognize as the same, reduce the utterances to the point that there is only a single functionally significant variable, i.e. the phoneme, or viewed from a slightly different point of view, the distinctive feature. If the phoneme is viewed theoretically as a unique bundle of distinctive features then if one can isolate a distinctive feature he can also isolate a phoneme. A morpheme then for a single idiolect is a unique sequence of phonemic segments when elicited in isolation as a complete utterance or affixed to a specific morpheme. Since the phoneme is a range unit, it will be clearly identifiable only when elicited in a situation such that the morphemes in the utterance can be identified only from the sound, e.g. the citation form of a major morpheme. This is true by the very nature of language because under other circumstances there are many additional cues, redundancies, in the social and linguistic context which enable the hearer to identify the morphemes without the sharp articulation of the phonemes or distinctive features. This allows for wide ranging free variation. In the citation form of a morpheme a phone will occur which is near the "central tendency" for a given phoneme in a given phonetic environment because it is necessary for the hearer to identify the morpheme with a minimal of external

cues, i.e. the morpheme must be identified from the sounds alone. An utterance is then, in theory at least, a sequence of these full forms, but because of the Markov process, information already shared by the speaker and hearer which does not need to be expressed verbally, and cues in the conversational situation, i.e. one is pointing at a bed so that the devoicing of the final /d/ would not be misinterpreted by the hearer, etc., many segments as well as distinctive features are omitted without reducing the intelligibility of the utterance, e.g. our friend /skʷəp/ for let us go up again.

In view of the discussion and evidence presented above, it seems realistic to consider the phonology of language on two levels: the phonemic and the distinctive feature. It is as necessary here for the linguist to consider both the phoneme and the distinctive feature as it is for the physical scientist to consider both atomic and sub-atomic particles in discussing the make-up of the universe. One could describe molecules as a particular arrangement of protons, electrons, etc., but it is clearly simpler to utilize the concept of the atom. The same is true for the phonology of languages. The phoneme then is a bundle of distinctive, as well as non-distinctive, features of vocal sound. Even under carefully controlled conditions the non-distinctive features are free to vary at will or following prescribed rules, e.g. aspiration of stops in English. The distinctive features cannot under such controlled conditions be varied beyond a certain acceptable range without the danger of misidentification of the intended morpheme. This implies that the phonemic system is a system of classification of sounds into a set of contrasting categories. The phoneme /i/ in a given language represents a collection of sounds, innumerable in the mathematical sense, which occur in slots in morphemes reserved for that phoneme. These classes by their nature overlap considerably but have a statistical norm such that when a contrast in meaning is needed, the native speaker can produce a sequence of phones near the appropriate norms and a given morpheme will be uniquely identified. However, since a given speech situation contains many redundancies, e.g. the statistical probabilities of given phonemes, morphemes, words, etc. occurring in a given slot, many functional units are dropped out in any real speech situation. Hence language structures consist of sets of statistical norms as opposed to logical norms.

The fact that a phoneme or distinctive feature can occur in one repetition of a particular utterance and not at all, or radically modified, in another means absolutely nothing so far as the functional significance of that unit is concerned. What tells the linguist that a particular range of sound is functionally different from another one is that when it is necessary for all information to be carried by the stream of speech, i.e. the sounds, certain stretches of sound differ in specific ways. The tremendous redundancy in normal speech makes it possible for many phonemes and/or morphemes to be omitted in normal speech with no loss at all in intelligibility. It is this redundancy that also permits the wide ranging phonetic differences for a specific phoneme which occurred in the transcriptions of Hanis. Most of this was not transcription errors but actual phonetic variation, in all probability, in the speech of the informant which was normal, because no information was lost by the variation.

NOTES

1 The research on which this paper was based resulted from three National Science Foundation Research Grants to study the languages of Oregon.

2 Daniel Jones, The Phoneme Its Nature and Use, second edition, 1962, p. 7.

3 Roman Jakobson, Gunnar M. Fant and Morris Halle, Preliminaries to Speech Analysis, Fourth Printing, MIT Press, 1963, p. 3.

4 N.S. Trubetskoi, Principes de Phonologie, translated by J. Cantineau, Paris, 1964, p. 44.

5 Naom Chomsky, Current Issues in Linguistic Theory, The Hague, 1964, p. 108.

6 Joe E. Pierce, "Phonemic Theory and the Analysis of English Syllabic Nuclei," Linguistics, Vol. 7, 1964, pp. 63-82.

7 Melville Jacobs, "Coos Myth Texts," University of Washington Publications in Anthropology, Vol. 8, No. 2, 1940.

8 Leo J. Frachtenberg, "Coos", BBAE 40, pt. 2, 1922, p. 306.

9 Melville Jacobs, "Coos Narrative and Ethnologic Texts," University of Washington Publications in Anthropology, Vol. 8, No. 1, 1939, pp. 14-15.